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### THE RAINFALL OF AMOY, CHINA.

By JOHN H. FESLER, United States Consul, dated Amoy, October 25, 1902.

The autumn rice crop in this province bids fair to be almost an entire failure, owing to the extremely small amount of rain which has fallen.

The rainfall at this port, it is interesting to note, has shown a steady decrease for the past six years, as is shown in the following table:

Year.	Inches.
1897.....	57.75
1898.....	46.24
1899.....	43.61
1900.....	38.70
1901.....	36.28
1902 (first eight months).....	26.13

As the rainfall for the last four months of the year averages not to exceed 2 inches, the total for 1902 will probably be less than 30 inches.

Local observers ascribe this steady decline to a coincident decrease in the force of the southwest monsoon.

The theory, based on these facts, is that the failure in the monsoon is due to alterations in the Japan Current, and that these alterations in turn are caused by deep sea seismic disturbances, which have culminated in the numerous volcanic eruptions which have recently taken place in various parts of the world.

Whatever the cause, it is certain that the continued and increasing shortage of rainfall is lessening the productive power of this portion of China, and is causing much hardship and discontent.

[NOTE.—Such periods of small and large annual rainfall occur all over the world in succession and have to do with the general circulation of the atmosphere; earthquakes, ocean currents, etc., do not explain them. Changes in the amount and quality of the heat received from the sun, or of the heat radiated from the earth and the atmosphere, would affect the temperature and circulation of the atmosphere, and, therefore, the local rainfalls. An equally important factor is the internal mechanism of the atmosphere and the modifications of the general circulation that can occur within a limited range under a constant rate of radiation from the sun. These two sources of change in meteorological phenomena must be thoroughly investigated and evaluated before undertaking the study of such minor matters as the influence of earthquakes and ocean currents.—C. A.]

### THE CIRCUMHORIZONTAL ARC.

By LOUIS BRVAIS, Paris, France, dated November 12, 1902.

In the MONTHLY WEATHER REVIEW for June, 1902, Vol. XXX, p. 317, there is reproduced a very interesting observation by Mr. J. A. Warren, of Santee, Nebr., who, on the 23d of June last, saw a rainbow arc parallel to the horizon at about 45° below the sun. In commenting upon this observation the Editor says that, so far as he knows, this is the first description of a horizontal circle tangent to the halo of 46° at its lowest point.

This particular tangential arc has a name in optical meteorology; it is called the circumhorizontal arc. In his "Note on halos," published in the *Annuaire Météorologique de France* for 1851, Bravais says that the theory of this arc is due to Galle; it is caused by the refraction of the light in the diedral angles of 90° at the lower base of the vertical prisms of ice, in the same way that the circumzenithal arc is due to the diedral angle of 90° at the upper edge of the same prisms. Theory indicates that this phenomenon only becomes apparent if the altitude of the sun is between 59° and 78°. I have not made the calculation but, judging from the latitude of the place, the date, and the hour, this condition seems to me to have been complied with at the time of Mr. Warren's observation. Was it really a circumhorizontal arc that was seen? This does not appear to me absolutely certain for the following reason. When the sun is very high in the sky the halo (of 46°) is very nearly parallel with the horizon, it would be absolutely so with a zenithal sun, and if an arc extending only a short distance from the lower part of this halo is seen, its parallelism with the horizon may seem to be perfect, especially if the arc is broad. Thus, according to the description given by the observer, the arc seen at Santee was very broad and quite short. It may then be asked if this was not merely the lower part of the circle of 46°?

In the note quoted above Bravais makes this remark: "The circumhorizontal arc is difficult to distinguish from the halo of 46° because the curves have the same direction and are near to each other." This difficulty must, indeed, be very great, if we may judge by the difficulty frequently experienced in distinguishing short and diffuse circumzenithal arcs from the halo of 46°, even although in this case the curves be in the contrary direction. It does not, therefore, seem to me to be possible to